NASA STTR 2010 Phase I Solicitation

T6.02 Advanced Portable Sensor Technology for High-Purity Oxygen Determination

Lead Center: JSC

Determining the purity of oxygen near 100% is problematic using portable electrochemical sensor-based devices. Accurate laboratory analysis is based on techniques such as separation (e.g., gas chromatography, GC) followed by peak integration or mass-spectral analysis. Though accurate, these devices are not readily portable, usually delicate and often require a carrier or calibration gas. While not specifically excluded, a carrier gas is strongly discouraged and calibration should require a minimum of consumables.

This solicitation seeks a reliable technique that can be applied to accurately assess oxygen purity in the range of 99.0% to 99.7% (see an example below)*. The technique or technology should be able to determine oxygen purity with a variety of simple diluents such as nitrogen, argon, hydrogen, water vapor and trace amounts of low molecular weight organics, CO and/or CO_2. It is not important that the technique specifically identify or quantify the diluents(s). The target accuracy for oxygen purity in the range is 0.05%.

Proposed technologies should be easily calibrated in remote locations, should be highly resistant to drift (i.e., long time between calibration cycles) and have potential to be adapted to a size and portability suitable to space missions. Potential applications include on-orbit determination of high-purity oxygen or other remote applications. A minimum of support equipment, maintenance, power and consumables is a key characteristic sought.

The first phase should address potential approaches with anticipated ranges of accuracy and precision along with known or potential limitations and interferences. Subsequent phase will be to develop and demonstrate a working prototype.

Example: The proposed technology should be able to reliably determine and differentiate the oxygen concentration between the following two example gas streams:

- 99.7% Oxygen, 0.2% Argon, 0.1% Nitrogen with a dew point of -60°C;
- 99.4% Oxygen, 0.4% Argon, 0.2% Nitrogen with a dew point of -40°C.